PATENT SPECIFICATION

686,705

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COMPLETE SPECIFICATION

Improvements in Hydraulic Direct Acting Suspension Shock Absorbers

I, CHRISTIAN MARIE LUCIEN LOUIS BOURCIER DE CARBON, a French Citizen, of 71, Rue Erlanger, Paris, France, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

In my Patent Application No. 11481—2—3—4/48 (Serial No. 686,662), I have described suspension shock absorbers of the hydraulic, direct-acting type with pistons shaped so as to ensure laminar flow of oil, that is to say, to ensure that the oil will flow in an extremely thin layer between the piston and the cylinder.

The present invention is concerned with developments of that invention.

In accordance with the invention, a hydraulic suspension shock absorber has a piston arranged to move in a cylinder containing a liquid, in which a permanently-open longitudinal passage is provided between the piston and the cylinder so as to permit laminar flow of the liquid from one side of the piston to the other, and in which the piston is guided by means of bearing surfaces formed on the piston and in contact with the cylinder wall, the bearing surfaces being spaced apart in a circumferential direction.

Preferably, the bearing surfaces are formed on one or more guiding flanges in the periphery of which are cut notches, for example in the form of segments of a circle.

In one particular form of the invention the piston is formed of two parts which bear against each other in a plane perpendicular to the axis of the piston, the said two parts being preferably assembled by the screwing of the piston rod into one of them.

In another particular form the piston just described is made of two parts each having a guiding flange, and the body of the piston between these flanges is encircled by a circumferentially continuous sleeve which has a high coefficient of expansion and which is located in a recess in the body of the piston.

The invention will be explained in more detail by way of example with reference to the accompanying drawings, in which:—

Figure 1 is an end view of a piston in accordance with Patent Application No. 11481—2—3—4/48 (Serial No. 686,662) referred to above.

Fig. 2 is an end view of a piston in accordance with the present invention.

Fig. 3 is a perspective view of another form of piston in accordance with the invention, and

Figs. 4 and 5 are longitudinal axial sections through two two-part pistons in accordance with the invention.

In the above-mentioned patent application the guiding of the piston is ensured by flanges formed on the piston and pierced with holes which, being of restricted dimensions, are to be numerous in order to reduce sufficiently the braking of the oil passing through them. Such a guiding flange is shown in Fig. 1. Experience has shown that that braking is not negligible and that it is advantageous for the passages through which the oil is to pass into the laminar flow space between the lateral walls 3 of the piston and the cylinder to be as large as possible.

In accordance with the present invention, the guiding of the piston is simply effected by discontinuous bearing surfaces such as 1 shown in Fig. 2. These surfaces are formed by cutting notches 2 in a flange g formed on the piston 3 so as to provide guiding surfaces 1. The notches 2 are shaped as segments of a circle.

These surfaces are thus sufficiently numerous and well distributed for there to be no fear of uneven wear of the cylinder walls.

A variant consists, as can be seen in Fig. 3, in providing the guiding portions

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Price 25p

21 over the whole height of the actual body of the piston, the laminar flow of the liquid taking place between the bearing surfaces in the space between the surfaces of small diameter 22 and the walls of the cylinder. The guiding portions can, if desired, extend over only part of the height of the body of the piston.

As shown in Fig. 4, the piston can be made up of two indentical parts 4 and 5, each part having a flange *g*, *h*, which is machined to form a discontinuous bearing surface against the cylinder wall. Obviously, only one part need be provided with a flange if so desired. These parts are assembled simply by screwing the piston rod 6, the end 11 of which is screw-threaded into a correspondingly screw-threaded hole in the part 4. The shoulder 12 of the rod 6 ensures that the part 5 will be locked to the part 4. Under these conditions, th drilling of the holes for the springs 7 and the balls 8 as well as the machining of the seats of the balls and of the abutment surfaces 10 for the springs, in order to provide pressure-sensitive valves are made very easy. In particular, it is no longer necessary to open those holes on the side remote from the ball and to provide a special part which is a force fit to form the bearing abutment for the spring. Screwing the piston rod 6 into the part 4 is sufficient for the mounting of the spring assemblies.

The part of the piston which is of expansible material and is destined to compensate the variations in viscosity of the oil due to temperature effects was, in certain earlier arrangements, constituted by the central part of the piston taken over its whole thickness. I have observed that it possible to obtain the same result by means of a simple annular ring; indeed, the increase in diameter of the piston results from the linear expansion of the external perimeter which is the same in both cases.

It is therefore advantageous, to effect that thermal compensation by mounting on the central part of the piston a ring 13 which is circumerentially continuous and of relatively restricted thickness. This is shown in Fig. 5 as applied to a piston of the kind shown in Fig. 4. Instead of a single ring, a number of superimposed rings each disposed in a circular groove of appropriate shape can be used.

It is to be noted that this arrangement harmonises particularly well with the construction of the piston in two parts described above. Indeed, the placing in position of the ring is then particularly easy as the latter slides freely over the parts 4 and 5 before the assembly of the latter and is fixed by the single operation of screwing the piston rod 6 into place.

What I claim is:—

1. An hydraulic suspension shock absorber having a piston arranged to move in a cylinder containing a liquid, in which a permanently-open longitudinal passage is provided between the piston and the cylinder so as to permit laminar flow of the liquid from one side of the piston to the other, and in which the piston is guided by means of bearing surfaces formed on the piston and in contact with the cylinder wall, the bearing surfaces being spaced apart in a circumferential direction.

2. A shock absorber according to Claim 1, in which the bearing surfaces are provided on one or more guiding flanges in the periphery of which are cut notches, for example in the form of segments of a circle.

3. A shock absorber according to Claim 1 or Claim 2 in which the piston is formed of two parts which bear against each other in a plane perpendicular to the axis of the piston, the two parts being preferably assembled by the screwing of the piston rod into one of them.

4. A shock absorber according to Claim 3 in which the piston is provided with housings formed by the juxtaposition of the two parts for pressure-sensitive valves.

5. A shock absorber according to any one of Claims 2—4 in which the piston is made of two parts each having a guiding flange and in which the body of the piston between the flanges is encircled by a circumferentially continuous sleeve which has a high co-efficient of expansion and which is located in a recess in the body of the piston.

6. A shock absorber piston substantially as described with reference to any one of Figs. 2—5 of the accompanying drawings.

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1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

Fig.1

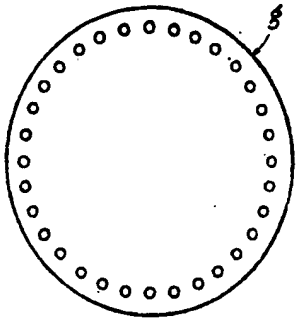

Fig.2

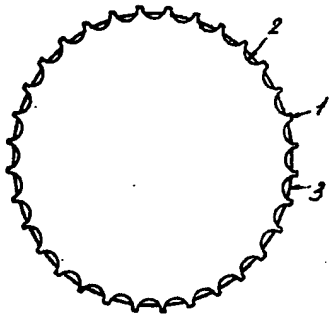

Fig.3

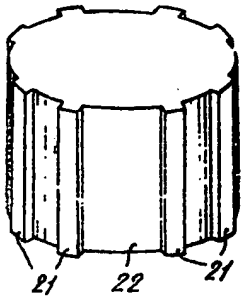

Fig.4

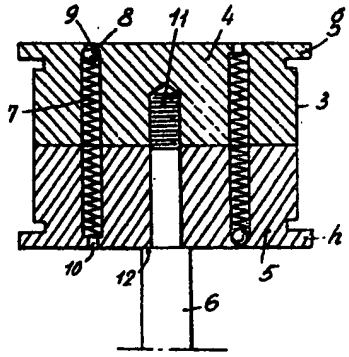

Fig.5